

Advanced Composite Thrust Chambers for the Altair Lunar Lander, Phase II

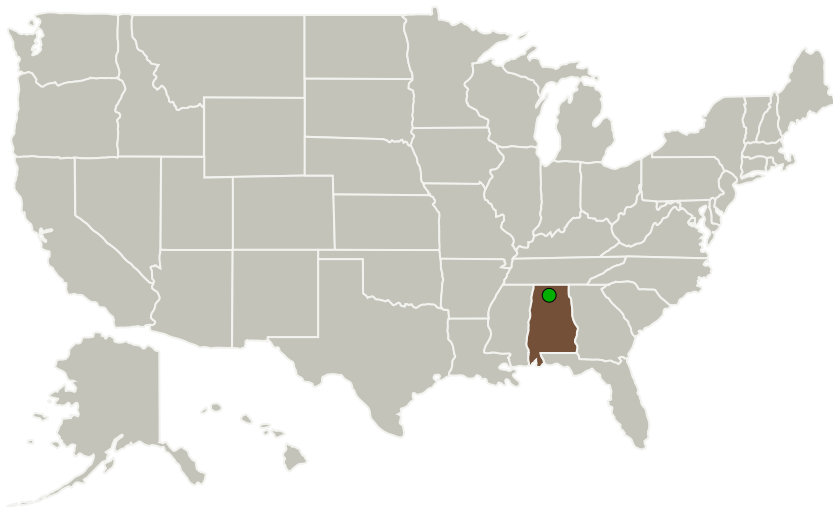
Completed Technology Project (2010 - 2012)



Project Introduction

Radiation-cooled, bipropellant thrusters are being considered for the Ascent Module main engine of the Altair Lunar Lander. Currently, iridium-lined rhenium combustion chambers are the state-of-the-art for radiatively cooled thrusters. To increase the performance of radiation-cooled engines, improved chamber materials are needed that will allow higher operating temperatures, better resistance to oxidation, and reduce mass. During this effort, an innovative composite thrust chamber is being developed that will incorporate advanced ceramic oxide and iridium liner techniques as well as replacing the expensive, high density rhenium with a low mass carbon-carbon composite. The Phase I results have demonstrated the potential of combining innovative fabrication techniques to produce an advanced ceramic-Ir lined C-C thrust chamber. Hot gas testing has shown the ability of the ceramic oxide coating to reduce the exterior temperature of the C-C jacket, which will enable the use of higher temperature propellants for improved performance. No damage was observed in the ceramic-Ir liner as a result of hot gas testing. During Phase II, the techniques will be optimized to allow fabrication of a 3000 lbf chamber that will be delivered to NASA-MSFC for hot-fire testing.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
● Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations

Alabama

Project Transitions



January 2010: Project Start



December 2012: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138781>)

Project Management

Program Director:

Jason L Kessler

Program Manager:

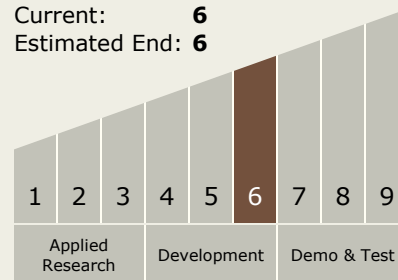
Carlos Torrez

Principal Investigator:

Angela D Hattaway

Technology Maturity (TRL)

Start: 6
Current: 6
Estimated End: 6



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - TX12.1 Materials
 - TX12.1.1 Lightweight Structural Materials

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System